

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
The Establishment of Policies and)	IB Docket 01-96
Service Rules for the Non-Geostationary)	
Satellite Orbit, Fixed Satellite Service)	
in the Ku-band)	

REPLY COMMENTS OF HUGHES COMMUNICATIONS, INC.

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EXECUTIVE SUMMARY

In general, the comments submitted indicate that, given sufficient coordination among the applicants and the resolution of certain technical issues, all of the applications for Ku-band NGSO FSS systems can be accommodated in a manner that will promote efficient use of spectrum resources, allow design flexibility, and serve the public interest. Despite the variety of proposals and debate on technical issues, Hughes believes that the comments generally indicate that inter-system coordination among the applicants is both necessary and the most effective way to derive the eventual spectrum-sharing plan. Whether or not the particular comments expressly acknowledge the fact, nearly all parties' choices on the proposed options, and all the proposed alternative schemes, are based on coordination among the applicants.

In this regard, Hughes respectfully urges the Commission to assist parties in coordinating and sharing technical information. If the Commission could assist applicants in resolving the ITAR compliance issues with the Department of State and other affected agencies, applicants could begin to share technical information and develop a coordinated spectrum-sharing plan.

While many of the commenters support the Avoidance of In-Line Interference Events sharing approach, the effectiveness of such an approach cannot be determined at this time, because parties and the Commission have yet to determine critical technical aspects of the proposed scheme. Recent work on spectrum sharing techniques, including work by the CCIR Working Party 4A in the International Telecommunications Union (ITU), indicate some of the technical aspects of the Avoidances of In-line Interference Events approach will need to be examined in more detail before it will be possible to determine whether this mitigation technique

will provide both satisfactory interference reduction and acceptable system performance for the interfered with and interfering systems involved.

However, the unanimous reaction of all parties is consistent with Hughes's position that both the Flexible Band Segmentation and the Dynamic Band Segmentation options are significantly flawed because the amount of spectrum available to each system would likely not be sufficient technically or economically to support a viable Ku-band NGSO FSS system providing broadband service. Similarly, with the sole exception of Virtual Geo, all parties either strongly criticize or expressly or impliedly reject the Homogeneous Constellation approach, as well as Virtual Geo's proposal that all applicants be required to deploy systems using Virtual Geo's proprietary VGSO orbit. In addition to the necessary restriction on design and service choices such a plan would entail, the potential negative competitive affects of the Homogenous Constellation approach could be significant.

Boeing and SkyBridge argue in their Comments that Hughes's separate applications for its HughesNET and HughesLINK systems should be treated as a single application and claim that Hughes has split its system into two applications to circumvent the rules and policies established by the FCC and the ITU. These allegations are completely unfounded, are based on speculation rather than supported by fact, and continue to ignore the simple fact that that the Commission's rules required Hughes to file separate applications.

Of the commenters, only Boeing argues for financial qualifications and continues to advocate its proposal of requiring separately earmarked funds. As Hughes has pointed out in its Comments, proposals identical to the "earmarked funds" proposal have twice been rejected by the Commission as unnecessary and counterproductive. In short, Boeing's proposal does not

promote the goals of the financial qualification requirements and completely ignores the reality of financing multibillion-dollar global satellite networks.

Hughes agrees with Virtual Geo that the proposed additional CDR and “bending metal” milestones are overly burdensome and would unnecessarily limit operator’s flexibility. Hughes further agrees with SkyBridge that the current milestone requirements adequately enable the Commission to determine early on whether spectrum will be used as proposed. Thus, there is no reason to go beyond the Commission’s current, time-tested requirement to add further detailed milestones that will prove unnecessary, overly burdensome, and intrusive.

Hughes strongly agrees with SkyBridge that the Commission should ensure that Ku-band NGSO licensees will have sufficient flexibility to adjust their international operations in accordance with differing international spectrum plans. Regardless of the spectrum-sharing plan eventually adopted, there is no reason to constrain U.S. licenses to uses and limitations (for example, to protect U.S.-based terrestrial services, or to limit certain sub-bands to gateway-only operations) that do not apply to international operations.

Finally, Hughes provides additional comment on the Commission’s proposals relating to non-common carrier treatment, blanket licensing, antenna reference pattern and off-axis E.I.R.P. density limits, geographic coverage, and reporting requirements.

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REPLY COMMENTS OF HUGHES COMMUNICATIONS, INC.

Hughes Communications, Inc. hereby replies to the comments filed in response to the Commission’s Notice of Proposed Rulemaking¹ in the above-captioned docket. Hughes submitted Comments in this proceeding and is an interested party as the applicant for two Ku-band NGSO FSS satellite systems—HughesLINK and HughesNET²—that will be subject to the Ku-band NGSO FSS service rules adopted by the Commission in this docket.

I. SPECTRUM-SHARING OPTIONS

In general, the comments submitted indicate that, given sufficient coordination among the applicants and the resolution of certain technical issues, all of the applications for Ku-band NGSO FSS systems can be accommodated in a manner that will promote efficient use of spectrum resources, allow design flexibility, and serve the public interest. Despite the variety of proposals and debate on technical issues, Hughes believes that the comments generally

¹ *The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ku-Band*, FCC 01-134 (rel. May 3, 2001) (“*NPRM*”).

² Application of Hughes Communications, Inc. for the HughesLINK Satellite System, FCC File No. SAT-LOA-19990108-00002 (filed January 8, 1999) (“*HughesLINK Application*”); Application of Hughes Communications, Inc. for the HughesNET Satellite

indicate that inter-system coordination among the applicants is both necessary and the most effective way to derive the eventual spectrum-sharing plan.

Hughes continues to support the Commission's decision to seek a spectrum-sharing approach that can accommodate all Ku-band applicants in this processing round, and appreciates the efforts of all parties who contributed their comments and proposals designed to achieve this goal. An approach premised on coordination among the applicants will likely result in a solution that can accommodate all proposed systems. Therefore, it is not necessary to consider spectrum-sharing proposals that are premised on the elimination of some number of applicants or that begin from the assumption, contrary to that set out in the NPRM, that there is insufficient spectrum to support all proposed systems.³

A. The Comments Generally Indicate That Coordination Among the Parties is the Best Solution to Spectrum Sharing in the Ku-Band

As Hughes stated in its Comments, negotiations among the parties is best way to ensure an efficient spectrum-sharing approach that would avoid the problems associated with each of the Commission's four proposals, as well as the alternate proposals advanced by commenters.⁴ The necessity of coordination among the applicants is reflected in nearly all the comments. Whether or not the particular comments expressly acknowledge the fact, nearly all

System, FCC File No. SAT-LOA-19990108-00003 (filed January 8, 1999) ("*HughesNET Application*").

³ See Comments of The Boeing Company, IB Docket NO. 01-96 (filed July 6, 2001)("Comments of Boeing") at 14. Boeing's proposal, essentially a modification of the Dynamic Band Segmentation approach, is expressly based on the assumption that all applicants cannot be accommodated. Boeing's proposal, like the Dynamic Segmentation approach, would create uncertainty as to whether systems would secure enough spectrum for viable operation; would entail loss of spectrum just as business expansion would demand more spectrum; would effectively reduce useable spectrum by segmentation; and in short, would increase the likelihood that not all systems would become operational.

parties' choices on the proposed options, and all the proposed alternative schemes, are based on coordination among the applicants.

Many parties explicitly agree with Hughes that coordination is the best way to share available spectrum. As SkyBridge puts it, “[c]oordination among applicants is the optimal method for sharing.”⁵ Denali points out that “industry self-determination” is essential to spectrum sharing and coordination among the parties; allowing the applicants to determine the most effective way to share spectrum will result in the most efficient spectrum use.⁶

Furthermore, those parties who support the Avoidance of In-Line Interference Events option generally do so because it allows all systems to be accommodated and because it promotes cooperation among the parties.⁷ This plan by its very nature would require close initial and continuing coordination among all operators. It is clear that by supporting this option, parties are essentially accepting that coordination (as opposed to some form of band segmentation) is necessary if all systems are to be accommodated.

The alternative proposals advanced by some Commenters are also premised on the necessity and benefits of coordination. For example, Boeing’s alternative proposal is essentially a variation of Flexible Band Segmentation with more emphasis on coordination among the parties.⁸ Under the proposal, parties operating outside of their “primary” spectrum coordinate to avoid interference to each other and the primary spectrum user; parties can

⁴ See Comments of Hughes Communications, Inc, IB Docket No. 01-96 (as corrected by Erratum filed July 12, 2001) (“Comments of Hughes”) at 4.

⁵ Comments of SkyBridge L.L.C., IB Docket No. 01-96 (filed July 6, 2001) (“Comments of SkyBridge”) at 4, n.18.

⁶ See Comments of Denali Telecom LLC, IB Docket No. 01-96 (filed June 18, 2001) at 3.

⁷ See Comments of Teledesic LLC, IB Docket No. 01-96 (filed July 5, 2001) (“Comments of Teledesic”) at 2; Comments of SkyBridge at 17; Comments of Boeing at 2.

coordinate to determine alternative protection criteria; and parties are expected to coordinate to reach “spectrum pooling” agreements.⁹

While the parties generally promote coordination as the necessary means to ensure all parties can be accommodated, the comments focus generally on coordination *after* a spectrum-sharing plan is adopted. It is absolutely necessary, however, that the coordination process occur before a solution is chosen. Coordination after adoption of a plan will be effective only if the plan is set up initially to make such coordination efficient, practicable, and equitable. Hughes agrees with many of the criticisms parties presented, especially with respect to the Dynamic Band Segmentation and Flexible Band Segmentation options. The “hybrid” or modified proposals advanced by several parties in response to the problems associated with these options may also provide some basis for coordination discussions towards a final sharing plan.¹⁰ However, without coordination among the parties, especially with respect to plans that would be technically complex to create and administer (for example, any hybrid plan using co-frequency spectrum sharing or a modified avoidance of in-line interference events approach), it will simply not be possible to create a proposal that will be properly tailored to the operational characteristics of all systems.

Furthermore, as discussed below, negotiations among the parties may help resolve technical issues that, at present, prevent the adoption of the Commission’s Avoidance of In-Line Interference Events option. Although this proposal may have the potential to accommodate all parties (and therefore has received more support than the other three options), significant

⁸ See Comments of Boeing at 3-7.

⁹ See *Id.*

¹⁰ See Comments of Virtual Geosatellite LLC, IB Docket No. 01-96 (filed July 6, 2001) (“Comments of Virtual Geo”) at 38; Comments of Boeing at 3.

technical issues would have to be resolved before this approach can be adequately assessed, much less adopted. The most effective way to resolve these issues is by coordination among the parties, rather than by adoption of arbitrary standards or standards that suit one or a few proposed systems to the detriment of others.

Along the same lines, the Commission should not issue conditional licenses that are subject to the resolution of a sharing plan and the other Ku band NGSO FSS service rules. Instead, the Commission should issue license only when it has finalized the Ku band NGSO FSS service rules and afforded the applicants an opportunity for conforming amendments to their system applications. As Hughes has explained before,¹¹ with so many core technical rules yet to be determined in this case, many of which fundamentally implicate the capacity of a given system, conditional licenses are unlikely to be useful to the Commission or the applicants.

Finally, Hughes respectfully urges the Commission to assist parties in coordinating and sharing technical information. Up to now, an informal coordination process has effectively been precluded: applicants have not been able to engage in technical discussions because of the need to comply with ITAR obligations. If the Commission could assist applicants in resolving this issue with the Department of State and other affected agencies, applicants could begin to share technical information and develop a coordinated spectrum-sharing plan.

B. Although an “Avoidance of In-Line Interference Events” Approach May Be Feasible In Theory, the Current Proposals Do Not Support a Workable Spectrum Sharing Plan

The effectiveness of an Avoidance of In-Line Interference Events sharing approach cannot be determined at this time, because parties and the Commission have yet to determine critical technical aspects of the proposed scheme. For example, parties disagree as to

the appropriate discrimination angle that should define an in-line event. SkyBridge's proposed 10° angle has been criticized by several parties as unnecessarily large,¹² yet on the other hand that discrimination angle may be too small, depending on the type of system under consideration.¹³ Furthermore, the SkyBridge proposal is premised on uniform power levels for all NGSO FSS transmitters.¹⁴ This assumption may not be feasible or desirable, considering that proposed systems have a variety of orbits and designs; imposing a requirement of equal transmitter power may burden certain systems (e.g. those with higher orbits) simply to maintain an arbitrary standard.

Recent work on spectrum sharing techniques indicate some of the technical aspects of the Avoidances of In-line Events approach will need to be examined in more detail before it will be possible to determine whether this mitigation technique will provide both satisfactory interference reduction and acceptable system performance for the interfered with and interfering systems involved.

One of these critical issues is avoidance angles. CCIR Working Party 4A in the International Telecommunications Union (ITU), has been looking into NGSO spectrum sharing techniques with the intent of recommending the techniques that should be deployed. In Document 4A/TEMP/81, recently presented at international meetings of the group in Seattle, the results of a study looking into the use of "in-line avoidance" mitigation was reported (see Section 3.3.5 of the above-referenced document). In this study six Ku-band NGSO systems were considered; two LEOs, three MEOs, and one HEO. The avoidance angles that are needed to

¹¹ Consolidated Reply of Hughes Communications, Inc., FCC File Nos., SAT-AMD-19980318-00021, *et al.*, at 3-7 (filed August 16, 1999).

¹² *See, e.g.*, Comments of Virtual Geo at 22.

¹³ *See* Comments of Hughes at 13.

achieve a 0 dB interference-to-thermal noise ratio between the sharing NGSO systems are shown in Table 2 of the document, a portion of which is reproduced as Table 1 below. The systems labeled L1, L2 are LEO systems, those labeled M1, M2 are MEO systems and the one labeled H2 is an HEO system. Table 1 shows that even for the case where the interference is allowed to be 50% of the total noise, not just 6% or 10%, the avoidance angles required can be as large as 20 degrees. This is especially true when the interfered with NGSO system is a LEO system and the interfering system is either a MEO or HEO system.

Table 1 – Avoidance Angles Needed for Sharing Among NGSO Systems

Protecting Non-GEO System	Protected Non-GSO System	
	USAKU-L1	USAKU-L2
USAKU-M1	20	20
USAKU-H2	20	20
USAKU-M2	-	20

These results show that a 10 degree avoidance angle is not sufficient when dealing with interference protection between different types of NGSO systems. Since the current list of Ku band applicants include 2 – LEOs, 3 – MEOs and 2 – HEOs, it is evident that all three types of NGSO systems will have to be dealt with and avoidance angles as large as 20 degrees may be needed.

In Annex 2 of the above-described 4A document, tables are given showing the time percentage that specified avoidance angles are exceeded for an earth station located at two different latitudes and longitudes. Table 2 gives these time percentages for the same five systems shown in Table 1.

¹⁴ See NPRM at ¶ 35.

Table 2 – Time Percentage During Which Angular Separation Exceeds Specified Avoidance Angle

Protecting Non-GEO System	For Earth Station located at 40 Degree North and 100 Degree West 20 degree avoidance angle		For Earth Station located at 30 Degree North and 80 Degree West 20 degree avoidance angle	
	USAKU-L1	USAKU-L2	USAKU-L1	USAKU-L2
USAKU-M1	75.7	73.1	85.7	68.9
USAKU-H2	83.9	79.4	87.7	73.4
USAKU-M2	41.6	63.7	48.1	58.1

The in-line events mitigation technique either requires satellite diversity or turning off transmission on certain sub-bands during the in-line event. The results given in Table 2 show that such in-line events occur from as much as 58 percent of the time to as little as 12 percent of the time with a more typical number being 30 percent of the time. For telecommunication systems, which typically provide service availabilities of greater than 97 percent, this suggests that this mitigation method is not very attractive as the primary method for interference suppression.

A sharing scheme that relies on satellite diversity poses distinct problems. The use of satellite diversity assumes two satellites are always in view from a given ground location and that the alternate satellite has the capacity to accommodate the traffic from all ground stations involved in the “in-line interference event.” Furthermore, it assumes the network can handle all the handoffs required at the right time. Since most networks and satellites have limitations on capacity and number of handoffs that can be carried out in a given interval of time, the ability to carry out satellite diversity will depend on the traffic distributions, and will not be

possible for traffic distributions where the number of user terminals exceeds a given density for areas on the ground smaller than those covered by the spot beams of the given satellite system.

In addition, an Avoidance of In-Line Interference Events option may impose disproportionate financial and technical burdens for systems that are not designed to provide dual-satellite coverage. As Virtual Geo points out, VGSO systems are designed to avoid interfering with GSO systems by relying on single satellites hanging near apogee. To achieve satellite diversity as a response to in-line events, such a system would have to add additional spacecraft solely for this purpose, thereby increasing system costs.¹⁵

If satellite diversity is not used, and instead, sub-bands are switched off during an “in-line interference event,” as indicated by the results in Table 2, the in-line events technique can result in a significant reduction in the available capacity of a given satellite system. As Hughes has already noted, an in-line events option may impose unequal burdens on systems depending on their overall design.¹⁶ For example, “full-mesh” systems (or any system incorporating numerous small earth stations) would be disproportionately burdened to mitigate in-line interference events than would systems relying on a smaller number of gateway terminals. In fact, the sheer number of end-user terminals that would have to accomplish satellite handoffs or frequency isolation simultaneously to achieve coordination could exceed overall system capacity.

From the above discussion, it is clear that further and more detailed investigation of the Avoidance of In-Line Interference Events option is needed. Unfortunately, the technical data needed to determine discrimination angles, time percentages, and other requirements is simply not available to parties at this time based on the information submitted in applications.

¹⁵ See Comments of Virtual Geo at 24.

For example, distributions of earth stations, and other details of traffic distributions, will be needed before the in-line event can be adequately assessed or its technical parameters determined. At the very least, it is essential that the Commission facilitate coordination among the parties so that the necessary information can form the basis of the eventual sharing scheme. If the Commission does adopt a scheme using some form of the Avoidance of In-Line Interference Events proposal, the eventual discrimination angles and other technical parameters will need to be taken from the actual operating characteristics of parties' systems, after coordination among applicants.

Finally, PanAmSat notes that the current in-line events proposal may be inadequate because it does not address the possibility that non-in-line events may exceed aggregate limits.¹⁷ Any final scheme must not only solve intra-service sharing issues, but must also prevent inter-service interference, for example with GSO systems. PanAmSat's concern also underscores the fact that many technical considerations remain to be resolved before the Commission could adopt the Avoidance of In-line Interference Events option, and that coordination among the parties facilitated by the exchange of detailed technical information would be a necessary prerequisite to any final spectrum-sharing solution.

C. Parties Agree That Dynamic Band Segmentation and Flexible Band Segmentation are Not Workable Options

The unanimous reaction of all parties is consistent with Hughes's position that both the Flexible Band Segmentation and the Dynamic Band Segmentation options are significantly flawed because the amount of spectrum available to each system would likely not

¹⁶ See Comments of Hughes at 11.

¹⁷ See Comments of PanAmSat Corporation, IB Docket No. 01-96 (filed July 6, 2001) at 6.

be sufficient technically or economically to support a viable Ku-band NGSO FSS system providing broadband service.¹⁸

Commenters also point out that these two options may limit design diversity or unduly affect certain proposed systems because they essentially assign spectrum on *a priori*, arbitrary grounds, and could force operators to redesign systems for contracting or expanding spectrum assignments in contradiction to changing operational requirements.¹⁹ As Hughes has pointed out, arbitrary spectrum assignments may result in a situation where an applicant would effectively not be able to fully utilize some of its assigned spectrum, for example if a “full-mesh” system were assigned part of its spectrum in a gateway-only sub-band.²⁰

Finally, parties note that these options would likely hinder coordination²¹ and would introduce uncertainty as to the ability to establish and maintain viable systems, which could be a significant impediment to financing applicants’ systems.²² The Commission has stated that it intends to license all applicants and wishes to find a spectrum sharing solution that can accommodate all proposed systems.²³ While it is, of course, possible that some proposed systems eventually may not be deployed, the Commission should not select a spectrum sharing option that will make it less likely that all systems will succeed.

¹⁸ See Comments of Hughes at 8-9; Comments of Teledesic at 2; Comments of SkyBridge at 7; Comments of Denali at 7, Comments of Virtual Geo at 29.

¹⁹ See *e.g.* Comments of Teledesic at 3; SkyBridge at 7,9.

²⁰ See Comments of Hughes at 4.

²¹ See Comments of SkyBridge at 7.

²² See Comments of Virtual Geo at 30.

²³ See NPRM at ¶ 1.

D. Homogeneous Constellations and Virtual Geo's Proposal

With the sole exception of Virtual Geo, all parties either strongly criticize or expressly or impliedly reject the Homogeneous Constellation approach, as well as Virtual Geo's proposal that all applicants be required to deploy systems using Virtual Geo's proprietary VGSO orbit.²⁴ In addition to the necessary restriction on design and service choices such a plan would entail, Hughes notes that the potential negative competitive affects could be significant. This applies both, as SkyBridge notes, for later entrants vis-à-vis the initial entrant,²⁵ as well as for all Ku-band NGSO applicants vis-à-vis providers of other competitive services.

Furthermore, Hughes agrees with SkyBridge that if the Commission were to select a Homogeneous Constellation approach, there is no particular reason to choose a VGSO system over other possible systems.²⁶ Indeed, as different systems tend to be more appropriate for different types of services, establishing one type of constellation may require applicants to significantly revise or even sacrifice their business plans.²⁷ At the very least, before a Homogeneous Constellation approach could be adopted, the Commission should allow and

²⁴ See generally Comments of Boeing (proposes either Avoidance of In-Line Interference Events option or own "hybrid" plan); see Comments of SkyBridge at 10-13 (rejecting Homogeneous Constellations approach and Virtual Geo proposal); Comments of Teledesic at 3 (same); Comments of Hughes at 13-14 (criticizing Homogeneous Constellations approach and questioning choice of VGSO systems is such an approach were selected); Comments of Denali (rejecting Homogeneous Constellation approach). Although Virtual Geo has modified its proposal to divide the allocated spectrum in to two halves, one requiring VGSO systems and the other allowing an Avoidance of In-Line Interference Events approach, the objections to such an approach are essentially the same. Furthermore, Virtual Geo's assertion that this "hybrid" proposal allows other applicants the option to deploy whatever type of system they choose, See Comments of Virtual Geo at iv, conveniently ignores the fact that such choice comes at the cost of requiring all other systems to operate together in half of the allocated spectrum, while Virtual Geo remains free to use the other half.

²⁵ See Comments of SkyBridge at 11.

²⁶ See Comments of SkyBridge at 11.

facilitate sufficient coordination between parties so that they could select a system that best supports their collective proposed services. If after sufficient coordination, parties agreed to a proposal based (in whole or in part) on a Homogeneous Constellation approach, the Commission should allow parties to amend their applications as necessary.

II. HUGHES'S TWO APPLICATIONS ARE FOR SEPARATE AND DISTINCT SYSTEMS

Boeing and SkyBridge argue, as they did in the pleading cycle on the Ku-band NGSO FSS applications,²⁸ that Hughes's separate applications for its HughesNET and HughesLINK systems should be treated as a single application.²⁹ Boeing, in particular, claims that Hughes has "split[]its system into two applications" in order to "claim a double share of spectrum resources and circumvent[] the aggregate interference limits in violation of rules and policies established by the FCC and the ITU."³⁰ These allegations are completely unfounded, are based on speculation rather than supported by fact, and continue to ignore the simple fact that that the Commission's rules required Hughes to file separate applications.

The HughesNET and HughesLINK applications describe two different systems, with distinctly different business plans, customer markets, and service offerings. HughesLINK is intended to provide backbone infrastructure and other transport-type services to large users. By contrast, HughesNET is intended to provide internet-access type service to the consumer and small office/home office markets. These two systems are entirely distinct and are not simply two halves of a single NGSO system.

²⁷ See Comments of SkyBridge at 11, 13.

²⁸ Consolidated Petitions to Deny or Hold in Abeyance of The Boeing Company at 22 (filed June 30, 1999); Comments and Consolidated Petition to Deny and/or Hold in Abeyance of SkyBridge, L.L.C. at 31 (filed June 30, 1999).

²⁹ See Comments of Boeing at 11; Comments of SkyBridge at 6, n.20.

Thus, to achieve their different service goals, HughesNET and HughesLINK utilize different constellations of technically different satellites. Hughes's two applications therefore do not present a situation where, in order to circumvent interference limits or "claim a double share of spectrum," an applicant divides a single constellation of technically identical satellites into two constellations in order to avoid the single-entry EPFD limit. Perhaps most importantly, Hughes's construction of the limited guidance on this issue in the Commission rules is that two applications are required in a case involving constellations of technically distinct satellites. Indeed, Commission rules require that Hughes pay two distinct filing fees.³¹ Neither Boeing nor SkyBridge have yet addressed this requirement or argued to the contrary.

III. SERVICE RULES

A. Financial Requirements

Hughes agrees with Virtual Geo, Denali, and SkyBridge³² that the Commission has correctly concluded that financial qualifications are not required, since all applicants can be accommodated. Furthermore, Virtual Geo evidently agrees with Hughes that the traditional financial qualification showing does not accurately address the unique problems involved in

³⁰ Comments of Boeing at 11.

³¹ See 47 C.F.R. §1.1107(10)(a) (1998) (Application for Authority to Launch and Operate (per system of technically identical satellites)).

³² SkyBridge states that financial qualifications would be required unless the Commission adopts the Avoidance of In-Line Interference Events option. See Comments of SkyBridge at 23-24. SkyBridge concludes that qualifications are not required for this option because it is the only one that can accommodate all proposed systems, in a manner that does not condition an applicant's deployment on other parties' progress. Comment of SkyBridge at 24. Presumably SkyBridge would agree that financial qualifications are not required so long as the scheme adopted shared these characteristics.

financing and completing a multi-billion dollar global network of the type proposed in this proceeding, and are therefore not a reliable indicator of such a system's likely completion.³³

Only Boeing argues for financial qualifications. Although Boeing continues to advocate its proposal of requiring separately earmarked funds, Hughes agrees with Virtual Geo that such a requirement would be a “meaningless (and arguably punitive) requirement as even large corporations, when undertaking a project as capital intensive as a multiple satellite network, generally look to outside sources of funding through public debt, equity offerings, and partner recruitment.”³⁴ As Hughes has pointed out in its Comments, proposals identical to the “earmarked funds” proposal have twice been rejected by the Commission as unnecessary and counterproductive.³⁵ Boeing's proposal does not promote the goals of the financial qualification requirements and completely ignores the reality of financing multibillion-dollar global satellite networks.

B. Implementation Milestones

Hughes agrees with Virtual Geo that the proposed additional CDR and “bending metal” milestones are overly burdensome and would unnecessarily limit operator's flexibility.³⁶ Hughes further agrees with SkyBridge that the current milestone requirements adequately enable the Commission to determine early on whether spectrum will be used as proposed.³⁷ The

³³ See Comments of Virtual Geo at 45.

³⁴ *Id.*

³⁵ See Comments of Hughes at 21-25.

³⁶ See Comments of Virtual Geo at 46.

³⁷ See Comments of SkyBridge at 24.

Commission's current milestone requirements, including the requirement of a non-contingent satellite construction contract, sufficiently ensure timely deployment of proposed systems.³⁸

Boeing argues that the Commission's alternative proposal of using the ITU "bringing into use" approach would be insufficient to ensure timely system deployment.³⁹

However, even assuming for the sake of argument that Boeing is correct, there is no reason to go beyond the Commission's current, time-tested requirement to add further detailed milestones that will prove unnecessary, overly burdensome, and intrusive. Even Boeing admits that enforcement of milestones consumes scarce Commission resources⁴⁰ and, as Hughes explained fully in its Comments,⁴¹ the additional proposed milestones would add to that burden without any concomitant benefit.

C. International Coordination

Hughes strongly agrees with SkyBridge that the Commission should ensure that Ku-band NGSO licensees will have sufficient flexibility to adjust their international operations in accordance with differing international spectrum plans.⁴² Regardless of the spectrum-sharing plan eventually adopted, there is no reason to constrain U.S. licenses to uses and limitations (for example, to protect U.S.-based terrestrial services, or to limit certain sub-bands to gateway-only operations) that do not apply to international operations. Requiring licensees to follow limitations that have no relevance in other countries will not in any way help the proposed

³⁸ See Comments of Hughes at 29-30.

³⁹ See Comments of Boeing at 18.

⁴⁰ See *Id.*

⁴¹ Comments of Hughes at 29-31.

⁴² See Comments of SkyBridge at 28; Comments of Hughes at 32-33.

systems succeed.⁴³ Finally, Hughes urges the Commission not to “attempt to implement internationally the VGSO/Non-VGSO band plan” proposed by Virtual Geo.⁴⁴ Besides the fact that the Commission has no authority to attempt such an implementation, requiring U.S. licensees to implement only VGSO systems (or requiring half of the allocated spectrum to be dedicated to VGSO systems) internationally would put U.S. licensees at a serious competitive disadvantage by limiting their options for international service vis-à-vis operators based in other countries.

D. Antenna Reference Pattern and Determination Of Off-Axis E.I.R.P. Density Limits

Despite the view of some Commenters to the contrary, Hughes strongly believes that the Commission is not yet in a position to decide whether antenna reference patterns or off-axis e.i.r.p. limits are required, and, if so, to determine what those patterns or limits might be. SkyBridge, for example, argues that defining e.i.r.p. limits would create certainty for designers.⁴⁵ However, it should be more important to develop a coordinated spectrum sharing regime that can accommodate all applicants, and then determine what, if any, e.i.r.p. limits (or antenna reference patterns) are needed.⁴⁶ Selecting these specifications before the details of the spectrum-sharing scheme are worked out may either result in wasted effort, or produce requirements incompatible with the plan eventually adopted.

For example, as Teledesic points out, because on-axis e.i.r.p. limits and off-axis e.i.r.p. limits are correlated, a party might comply with the off-axis limit by lowering its on-axis

⁴³ *C.f.* Comments of Boeing at 19.

⁴⁴ Comments of Virtual Geo at 53.

⁴⁵ *See* Comments of SkyBridge at 22-23.

⁴⁶ *See* Comments of Hughes at 17-18

e.i.r.p. Since this would as a general matter make it harder to protect such a system, it would raise significant problems if an Avoidance of In-line Interference Events scheme were adopted.⁴⁷ Finally, Hughes agrees with Teledesic that compliance with these requirements will add cost to applicants' systems.⁴⁸ Thus, the Commission should not impose such costs unless the spectrum-sharing plan that the Commission ultimately adopts makes them necessary.⁴⁹

E. Non-Common Carrier Treatment, Blanket Licensing, Coverage Requirement, and Reporting Requirements

All Commenters who addressed the issue of regulatory treatment agreed that the Commission should continue its policy of allowing applicants to choose whether to operate as common or non-common carriers.⁵⁰ In light of the general support of applicants and the Commission's longstanding application of this policy, the Commission should allow Ku-band NGSO applicants to choose the way their proposed systems will be regulated.

Likewise, all those Commenters who addressed the issue support blanket licensing of earth stations.⁵¹ Hughes wholeheartedly concurs with all Commenters on this point and urges the Commission to promote widespread commercial deployment of all proposed Ku-band NGSO FSS systems by adopting the proposed blanket licensing approach.

⁴⁷ See Comments of Teledesic at 10.

⁴⁸ See Comments of Teledesic at 10.

⁴⁹ Although Virtual Geo asserts that defined antenna patterns and off-axis EIRP limits can benefit sharing among systems using homogeneous constellations, See Comments of Virtual Geo at 42, the majority of Commenters agree that the Homogeneous Constellation approach should not be adopted.

⁵⁰ See Comments of Boeing at 19; Comments of Denali at 9; Comments of Virtual Geo at 50; Comments of SkyBridge at 29; Comments of Hughes at 28.

⁵¹ See Comments of SkyBridge at 21; Comments of Virtual Geo at 41; Comments of Boeing at 16; Comments of Teledesic at 9; Comments of Hughes at 15.

With one exception, all Commenters who discussed the Commission's proposed coverage requirement concurred with Hughes that the proposed requirement was reasonable.⁵² The Commission would benefit the public by requiring continuous service throughout the fifty states, Puerto Rico, and the US Virgin Islands, and by requiring each licensed system to be able to serve locations as far north as 70, and as far south as 55 degrees latitude, at least 75% of the time. As Hughes stated in its Comments, both of Hughes's proposed systems will comply with this requirement.⁵³

Alone among Commenters, Virtual Geo argues that a coverage requirement should not apply to VGSO systems because, "the inherent versatility of the technology virtually guarantees global coverage by a variety of service providers pursuing different service plans."⁵⁴ This argument is unpersuasive. Whether other VGSO systems are implemented or not, and regardless of the possible attractiveness of such systems, applicants should not be able to point to other systems using similar technology to satisfy its obligations to serve all regions equally. Each applicant should be required to demonstrate that its proposed system can comply with the coverage requirement. Anything less would constitute a significant compromise on behalf of the public interest, based simply on the assurance that unknown future applicants will make up for the deficiencies of a current applicant's proposed service.

⁵² See Comments of SkyBridge at 23, Comments of Denali at 7, Comments of Boeing at 19, Comments of Hughes at 18.

⁵³ See Comments of Hughes at 18.

⁵⁴ Comments of Virtual Geo at 44.

All parties who addressed the issue support the Commission's proposal to eliminate the requirement to report unscheduled satellite outages.⁵⁵ As Hughes noted in its Comments, current spectrum resource availability makes the requirement unnecessary.⁵⁶

Finally, Virtual Geo opposes the annual reporting requirement on the ground that it is unnecessarily burdensome,⁵⁷ Hughes agrees with Boeing and SkyBridge that such a requirement is reasonable.⁵⁸

IV. CONCLUSION

For all of the forgoing reasons, Hughes respectfully requests that the Commission take the actions proposed in Hughes's initial Comments in this proceeding and in these Reply Comments.

⁵⁵ See Comments of Boeing at 19, Comments of Virtual Geo at 50; Comments of SkyBridge at 30; Comments of Hughes at 31.

⁵⁶ See Comments of Hughes at 31.

⁵⁷ See Comments of Virtual Geo at 50.

⁵⁸ See Comments of Boeing at 19, Comments of SkyBridge at 30.

Respectfully submitted,

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